

On the Lampreys of Japan together with Notes on a Specimen of Lamprey from Siberia.

BY

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For some years past, I have been engaged in collecting materials for the study of the species of *Petromyzon* which occur in Japan, and of their distribution. The present notes embody the results so far obtained, and while not yet complete, will, it is hoped, prove of some interest. In addition to this, I append at the end a brief notice on a specimen from Siberia.

The materials employed in the present investigation are (a) the specimens in the Zoological Institute of the Science College, (b) the specimens in the Imperial Museum,¹⁾ and (c) those in my own possession partly collected by myself at several localities in the year 1891—1899, and partly collected and sent to me by the undernamed gentlemen in various parts of the country,²⁾ to whom my best thanks are due:—

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A. *On the Species of the Japanese Lampreys.*

A collection of the Japanese Lampreys falls naturally into two groups; (1) a larger form measuring 39.0—50.7 cm in length and (2) a smaller one having length of 8.0—15.6 cm. The larger form is undoubtedly the one described by v. MARTENS under the name of *Petromyzon japonicus*. Unfortunately I have been unable to see the original description. GÜNTHER¹⁾ makes the following remark on it: "*Petromyzon japonicus*, Martens, Wieg. Arch. XXXIV, p. 3, does not appear to be specially distinct from *P. fluviatilis*. The dentition in both is extremely similar, only the Japanese example has an additional transverse series of small teeth behind the mandibular tooth. The figure accompanying the description of *P. japonicus* is incorrect and I am indebted to Professor Peters for re-examination of the typical specimen" (p. 504)

PROF. JORDAN has called it, in his "Preliminary Check List of the Fishes²⁾ of Japan," *Petromyron japonicus* following MARTENS' nomenclature.

As GÜNTHER states, this form of the "Japanese Lamprey closely resembles *P. fluviatilis*, that is, the position of the fins, the coloration of the body, the branching mode of the marginal tentacles of the suctorial disk, the maxillary tooth, the lingual tooth, the teeth of the suctorial disk, the structure of the brain (see below), &c. all agree with those described in *P. fluviatilis*. But there are found two points of constant differences:—

- (1) The first point has already been noted by GÜNTHER. He notes "an additional transverse series of small teeth behind the mandibular tooth." I would replace the word "behind" with the word "inside," because this series of the teeth is found immediately *inside* the mandibular tooth-plate. It should be noted that these teeth which are 3—4 in number are, so far as I am aware, not yet enough hardened to deserve

1) GÜNTHER. Cat. of Fishes, vol. VIII.

2) This Journal. vol. III, pp. 31—159, 1891.

the name of teeth, but are the merely hardened horny projections of the skin.

- (2) The number of the cusps of the mandibular tooth-plate is described in *P. fluviatilis* as being seven or about seven. In the Japanese species, this tooth-plate has constantly six cusps of which the cusp at each lateral extremity of the plate is bifurcated.

I propose, therefore, to regard the Japanese form as a distinct species and to call it *Lampetra* ¹⁾ *japonica*.

This Lamprey does not occur in all the parts of the empire, but is limited to certain localities (see below).

There has not been published any description of the smaller Lamprey ²⁾; it differs from the larger form just stated not only in size but also in the following essential characters:—

- (a) The suctorial disk is protruded more than in the larger one;
- (b) The tooth-cusps are less prominent and more obtuse than in the larger form, and the series of the teeth outside the mandibular tooth-plate consists of a lesser number than in the larger form; the cusps at lateral extremities of the mandibular tooth-plate are not bifurcated;
- (c) The first dorsal fin is not separated by a space from the second dorsal, but there is only a notch between them; the anal fin in the female attains in the spawning season a considerable height; this is called by S. H. GAGE the fin-like appendage;
- (d) The labial tentacles are mostly palmate;
- (e) The skin is dark brown and shows faint irregular spots. This species is thus in the external characters very close to *P. planeri* (Bl.). In addition to these, two species show a great similarity in the external configurations of brain (see below). But (1) the smaller size and (2) the smaller number of the mandibular tooth-cusps are the constant

1) For the reason brought out further on, I have adopted the generic name *Lampetra* for this species.

2) V. Martens only touches it in his "Die Reise nach Ostasien."

differences which distinguish it from the latter. It must, therefore, be regarded as a distinct species; and I have great pleasure in calling it *Lampetra mitsukurii* in the honour of PROF. MITSUKURI.

The size varies within certain limits; it is not infrequent that the individuals from some localities are double those from others.

The American Brook Lamprey, *Lampetra wilderi* (GAGE)^{1, 2)} is very close to this species; it is, as it seems to me, probably its nearest ally²⁾.

I may perhaps be permitted to add a few words in regard to the brain of two Japanese species of Lamprey. I find that the adult individuals of the both species are remarkably alike in the external configurations of their brain, which are again very close to those of *P. fluviatilis* of Europe. (see AHLBORN'S⁴⁾ figs 4—6). Therefore, if AHLBORN'S statements and figures (figs. 1—3) on *P. planeri* be trusted which maintain some difference between its brain and that of *P. fluviatilis*, they might be taken to be opposed to the idea of a near affinity between *P. planeri* and *L. mitsukurii* mentioned above. But there is a strong reason doubting the accuracy of AHLBORN'S results. It appears to me that the brain of *P. planeri* as given in his fig. 1 is that of a young individual, for the brain obtained from the oldest Ammocoetes stage of the smaller Japanese species shows very much the same configurations. This doubt is further confirmed by the fact that the figures (figs. 5 & 6) of the brain of *P. planeri* given by WIEDERSHEIM⁵⁾ agree closely with the brain of *L. mitsukurii* of Japan.

I accept mainly on account of the brain configurations just stated, the views of recent writers in maintaining that the genus *Petromyzon* should be split into two: retaining the old name *Petromyzon* for *P.*

1) GAGE, The Lake and Brook Lampreys of New York: WILDER'S Quarter-century Book, 1893.

2) JORDAN AND EVERMANN, Fishes of North and Middle America, Pt. I, 1899.

3) *P. marinus* has not been hitherto met with in Japan.

4) AHLBORN, Untersuch. ü. d. Gehirn der Petromyzonten; Zeitschrift f. w. Zool., Bd. XXXIX, 1883.

5) WIEDERSHEIM, Das Gehirn von Ammocoetes und Petromyzon planeri; Jen. Zeitschrift, Bd. XIV, 1880.

marinus and assigning GRAY'S name *Lampetra* to the portion represented by *fluviatilis*, *planeri*, *mitsukurii*, *wilderi*, &c.

B. *Distribution of the Lampreys in Japan.*

The smaller Lamprey, *Lampetra mitsukurii*, is found in almost all localities of the empire, while the larger form, *L. japonica*, is limited to the rivers and ponds on the slope facing the Japan Sea on the main island (the Hondo); the latter is especially abundant in the Shinano River, the Mogami River, the Omono River, the Jintsu River, the Lake Kawakita, the Kozan Pond, &c. It has been maintained by some persons that the larger Lamprey is occasionally met with in the marshy regions of the Kwantō-Plain and in the mouth of the Kiso River and of the Kitakami River and their adjacent waters. As these localities all belong to the Pacific side, I have been at great pains to obtain the specimen from them, but all my efforts were unfortunately so far proved fruitless.

Let us now try to explain this peculiarity in the distribution of the Lampreys on the main island.

As is well known, the long chain of the islands, of which our empire is composed, extends from the parallel of about 52° north to the parallel of 22° with an oblique north-east or south-west direction. As regards the main island, the long range of high mountains running lengthwise in the central part constitutes the water-shed which divides rivers into two sets of systems: the rivers on the slope facing the Asiatic Continent empty their water into the Japan Sea, and the streams on the opposite slope flow into the Pacific Ocean. The rivers on the Pacific slope have in general a very steep incline, and their waters rush down in torrents after heavy rains, and in most of the rivers, almost drying up or dwindling into mere threads of water at other times. Thus their bed consists, in most parts, of sand and gravel. On the contrary, the rivers on the opposite side are less steep, and their bed is muddy. These topographical conditions exert, it seems to me, a great influence upon the distribution of Lampreys in Japan, as the following considerations will show.

Sluggish creatures like the Lampreys can not naturally flourish in rapid currents even when other conditions are favorable. Thus the larger Lamprey which inhabits preferably the muddy bed of rivers, lakes, ponds, and river-mouths ; and in the spawning season alone ascends rivers to deposite eggs on the sandy bed of their tributaries, would not find such conditions in the rapid streams of the Pacific slope. The poor creatures could not be able to hold themselves. This, it seems to me, sufficiently accounts for their absence from the river systems of that side.

On the other hand, the smaller Lamprey does not live in rivers, but generally in small streamlets between the fields, in springs, or in small canals near towns. The animal being thus independent of rivers their habitation has been able to extend itself all over the main island wherever other natural conditions allow them.

There will be nothing to clash with the views put forward here, if the larger Lamprey should be found hereafter, as is very likely, in marshy regions of the Kwanto-Plain as well as in estuaries with the muddy bed as the mouth of the Kiso River and of the Kitakami River, although these localities belong to the Pacific side. On the contrary, such a discovery could go a long way in proving the correctness of the above hypothesis.

Let us now turn to the examination of other islands: Shikoku, Kyūshū, and the Hokkaidō, &c.

Geologists tell us that the inland sea (the Setouchi-Umi) between Shikoku, Kyūshū, and the main island was brought about by *faults* and constitutes a geological moat. The distribution of the Lampreys affords the excellent evidence for this view. The two great southern islands, Shikoku and Kyūshū, show, as regards the distribution of the Lampreys, the same condition as the Pacific side of the main island ; on these islands the smaller species alone is found ; they are to be regarded, in this respect, as belonging to the Pacific slope.

In the Hokkaidō, only the slope facing the Japan Sea has been explored ; in this part, the larger as well as smaller forms occur, just as

in the corresponding slope of the main island. The former species is found in the Ishikari River and the Teshiwo River, whilst the latter form is met with abundantly in streamlets in that part of the island.

Sado, a small island in the Japan Sea off the Peninsula of Noto, is very interesting; it is the same, as to the *Petromyzon* distribution, as the localities on the opposite shores of the main island, viz: Noto, Toyama, Niigata, Sakata, &c.

In the Ryūkyū (Loochoo) islands, the Lampreys have not yet hitherto been found; these seem to be destitute of Lampreys.

I have not yet explored the Lamprey fauna of Formosa; this I hope to deal with on a future occasion together with that of the opposite coast on the Asiatic Continent.

If the above assumption be correct, it is clear that the distribution of the Lampreys in our empire is dependent on the topographical features. The influences of other natural conditions, if such truly act upon the life of the animal, are very little as regards the distribution.

C. *On a Specimen of the Lamprey from Siberia.*

I have recently received a specimen of the Lamprey from Eastern Siberia, which was caught in a brook called Pervaya Rechka, a tributary of the Amur River, not far from the Seaport of Vladivostock. It was taken last summer and sent to me by my friend Mr. ABENO who has resided there for about seven years. He writes to me that the Lamprey is very rare in the neighbourhood of the city, and that he has seen only two individuals during that time of his residence.

The specimen is just transformed individual and is preserved in good condition in alcohol. It measures 15 cm; therefore, it is smaller than the larger specimen of *L. mitsukurii* and larger than smaller ones among it. The second dorsal fin is continuous with the caudal; the first and second dorsals are separated by a deep notch. The first dorsal is 3 mm high, while the second is 5 mm in height. The distance from the snout to the anterior limit of the first dorsal is 7 cm. The head is about as long as the branchial region or the thorax. The supraoral lamina is

provided with 2 well separated obtuse cusps ; the infraoral lamina possesses 6 obtuse cusps. 3 bicuspid teeth are found on each side of the gullet. Other buccal teeth are simple and describe a circle immediately inside of the fringe of the labial tentacles. Each labial tentacle is palmate, terminating in a blunt point. The specimen is female, but wants the anal lobe (the fin-like appendage), probably owing to being caught out of the spawning season. Coloration is quite like the Japanese specimen of *L. mitsukurii*.

The specimen is thus very close to *L. mitsukurii* of Japan ; in fact, both are, I think, of the same species. It is, therefore, also very close to *L. wilderi* (GAGE) of North America.

Let us now examine other species of the Lamprey of East Siberia.

I have not seen the description of the Lamprey of Kamtschaka by PALLAS;¹⁾ but by the account of DR. JORDAN,^{2,3)} I know that two species of the Lamprey, *Eutosphenus camtschaticus* (TILLESUS) and *Lampetra camtschatica* (PALLAS), are found in Kamtschaka. On the former species he remarks : " A larval lamprey obtained by STEJNEGER in the Paratunka River, near Petropaulski, Kamtschaka, is apparently of some species of *Eutosphenus*. It can not be distinguished from the larva of *Eutosphenus tridentatus*, though the adult may show peculiar characters " (p. 434). *Eutosphenus tridentatus* is, according to JORDAN, common southward along the coast of Unalaska. The author puts the second species (*Lampetora camtschatica*) synonymous with *Lampetra aurea* (BEAN), which is found also in the Yukon River and other streams of Alaska. Thus the two species, *Eutosphenus tridentatus* and *Lampetra aurea*, occur common on the two continents, Asia and North America, separated by the Behring Strait.

Lampetra aurea is, according to JORDAN, very close to *Petromyzon fluviatilis* of Europe, and therefore, also to the larger Lamprey (*L. japonica*) of Japan.

1). PALLAS, Zoographia Rosso-asiatica, 1767.

2). JORDAN, Report of Fur-Seal Investigations, Part. 3, 1899.

3). JORDAN & EVERMANN, Fishes of North and Middle America, Pt. I., 1899.

My friend Mr. UYEDA in Nikulaevsk informed that there are found Lampreys abundantly which much resemble the larger Lamprey of Japan; these may be of the same species as *Lampetra camtschatica* (PALLAS) or *L. aurea* (BEAN).

Thus together with *Lampetra camtschatica* which is the same or at least very close to *Lampetra japonica* of Japan, the present species is represented on the Japanese Island. I do not hesitate in concluding, therefore, that the coasts round the Okhotsk Sea and the Japan Sea show, with regards the Lamprey fauna, a uniform character with exception of *Entosphenus tridentatus* which is wanting in Japan.

From the accounts given above, it is also true that the Lamprey fauna of Japan is connected through Kamtschaka, on one hand, with North America and, on the other, with Asiatic Continent.

I wish to express my deepest thanks to my teacher, PROF. Mitsukuri, who kindly looked through the manuscripts.

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